FEB 1 1971

UNITED STATES
ATOMIC ENERGY COMMISSION
WASHINGTON, D.C. 20545

JAN 30 1971

Dr. Joshua Lederberg
Department of Genetics
Stanford University School of Medicine
Palo Alto, California 94304

Dear Josh:

I wish to thank you for sending me the copies of your letter to the Chairman of the Select Committee on Nuclear Electricity of the Pennsylvania State Senate and the article referred to therein, detailing your approach to an analysis of the costs associated with an increase in the human mutation rate.

You have given us a reasonable and provocative way of looking at the problem. Since the various figures on the genetic component of morbidity and its costs and on the increment in mutation rate per unit dose, as well as the relationship between an increment in mutation rate and the corresponding increase in morbidity must be regarded as having some degree of uncertainty, we accept the view that estimates of damage should be conservatively high. In addition, we agree that these estimates should not be lowered until there is firm evidence to support such a reduction.

We are very much in sympathy with your view that research should be supported that will lead to the amelioration of genetic damage. It is imperative that work of this type be supported even if there were no mutation rate increments due to technological causes, since a large fraction of man's genetic ills will continue to arise from natural causes, i.e., maintained by spontaneous mutation or by selection in polymorphic systems.

There is, therefore, no real disagreement between us as to the possible magnitude of genetic damage induced by a given dose of radiation, nor of the obligations that our society has for minimizing that damage and of ameliorating <u>all</u> of our genetic ills that our skills and ingenuity will permit.

The problem that faces us undoubtedly stems from the fact that while one must deal with maximum permissible doses as defined by the FRC

guidelines, in our activities we must relate these to, and be concerned with maximum permissible concentrations. It seems that the major difficulty that we experience is in persuading the public that the methods of regulating reactor effluents are giving and will continue to give the very low population doses that we estimate. Using your cost analysis, and our estimates of the exposure to the general public (< 0.001 millirem per year), I can calculate the debt owed for generation of energy from nuclear power plants to be less than one hundredth of one cent per capita for the year 1970, and my best current estimates are that this will not exceed 0.2 of one cent per capita in the year 2000! Useful information concerning actual doses to be expected from nuclear power plants is contained in the manuscript entitled "Average Dose to a Population vs Maximum Limits: Airborne Radiation from the Nuclear Power Industry" by Dr. J. B. Knox. A copy of this manuscript will be forwarded to you by Dr. John R. Totter.

What we must do, to borrow your statement, is to solve this "public relations problem," and somehow make it clear to the public that the expansion of nuclear power plants will lead to effective gonadal doses from reactor effluents that are orders of magnitude smaller than the 170 millirem usually talked about. In an attempt to do this, in part, I have taken the liberty of incorporating your approach in a cost-benefit analysis for radiation exposure, in a chapter of a book which I am writing, in an effort to make some comparisons of risks associated with exposure to various sources of radiation. I am enclosing a copy of a portion of that chapter, and your thoughtful comments on this matter will be sincerely appreciated.

Cordially,

Chairman

Enclosure:
As stated

Recommendations on Radiation Exposure Policy

"The AEC, during the decade of the 1970's, will program nuclear energy activities so as to minimize the dose-commitment of the U.S. population to the lowest practical value. It will in any case plan to limit that commitment to less than 10 mrem per capita per year, averaged over the U.S. population. We are advised by geneticists that this exposure, which is only one-tenth the natural radiation background, will not influence the mutation rate by as much as one-percent of its "normal" value, and that this is the most sensitive indicator of any adverse biological effect of radiation. 10 mrem/year is, furthermore, a small part of the variation in background radiation found at different altitudes in the U.S. or resulting from different geological formations.

According to our calculations, this policy objective will be met by adherence to the existing standard that limits radiation levels to 500 mrem/year at the boundaries of nuclear sites, in view of the rapid falloff of exposure with distance from radiation sources. In fact, most nuclear installations have operated a large part of the time at dose rates far below this rigorously enforced standard.

(. . . then language on the difference between a population exposure policy of the AEC and the emission standards imposed on a given plant.)

Finally, this policy has been based on a conservative evaluation of the best available data on biological effects of radiation. It is, for example, more restrictive than the standards suggested by the NCRP. The AEC will continue to sustain an active program of research needed to narrow the zone of uncertainty in these calculations. The conservative approach we have adopted suggests that further knowledge will very likely justify an eventual relaxation of this policy which may be a desirable option if the use of nuclear fission for power continues to expand in the next century. We have, nevertheless, deemed it prudent to adopt a relatively pessimistic view in assimilating uncertainties that exist at the present time into our policies for this decade.

With the cooperation of the nuclear industry, physical and biological scientists, and concerned citizens we believe we can move forward in the use of nuclear technology to solve pressing needs for economical power.